

Espectros de cada etapa:

1. $A_1 m(t) \cos(2\pi f_0 t + \theta_0)$

$$A_1 m(t) \left(\frac{e^{j2\pi f_0 t} + e^{-j2\pi f_0 t}}{2} \right) = A \left(\frac{m(t) e^{j2\pi f_0 t}}{2} \right) + \left(\frac{m(t) e^{-j2\pi f_0 t}}{2} \right)$$

con $\mathcal{F}\{x(t) e^{j\omega_0 t}\} = X(\omega \mp \omega_0)$

$$\frac{A}{2} M((\omega - 2\pi f_0) + (\omega + 2\pi f_0))$$

2. $\cos(2\pi f_0 t + \theta_0)$ con $\theta_0 = 0$

$$\cos(2\pi f_0 t) = \left\{ \frac{e^{j2\pi f_0 t} + e^{-j2\pi f_0 t}}{2} \right\} = \mathcal{F}\left\{ \frac{e^{j2\pi f_0 t}}{2} \right\} + \mathcal{F}\left\{ \frac{e^{-j2\pi f_0 t}}{2} \right\}$$

con $\mathcal{F}\{e^{j\omega_0 t}\} = 2\pi \delta(\omega \mp \omega_0)$

$$F(\omega) = \pi \delta(\omega - 2\pi f_0) + \pi \delta(\omega + 2\pi f_0) \rightarrow \text{Mixer.}$$

$$A_1 m(t) \cos^2(2\pi f_0 t + \theta_0) = \frac{A_1 m(t)}{2} + \frac{A_1 m(t)}{2} \cos(4\pi f_0 t + 2\theta_0)$$

$$F(\omega) = \frac{AM(\omega)}{2} + \frac{A}{2} m(t) + \left(\frac{e^{j4\pi f_0 t} + e^{-j4\pi f_0 t}}{2} \right)$$

$$F(\omega) = \frac{AM(\omega)}{2} + \frac{A}{2} \left(\frac{m(t) e^{j4\pi f_0 t}}{2} \right) + \left(\frac{m(t) e^{-j4\pi f_0 t}}{2} \right)$$

con $\mathcal{F}\{x(t) e^{j\omega_0 t}\} = X(\omega \mp \omega_0)$

$$F(\omega) = \frac{AM(\omega)}{2} + \frac{A}{4} M((\omega - 4\pi f_0) + (\omega + 4\pi f_0)) \rightarrow \text{low pass.}$$

$$\frac{A_1}{2} m(t)$$

$$F(\omega) = \frac{AM(\omega)}{2} \rightarrow \text{scale amplitude by } \frac{2}{A_1}$$

$$\frac{A_1}{2} \cdot m(t) \cdot \frac{2}{A_1} = m(t)$$

$$F(m(t)) = M(\omega)$$